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# PATENT SPECIFICATION (21) 67,061/74

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Int. Cl. (51) F27D 1/10

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entitled (54)

67061/74  
FURNACE LINING  
INSTALLATION SYSTEM

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(Accompanied by a Provisional  
specification)

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Related Art (56)	465631	(45774/72)	19.2
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	127030	(951/46)	19.2, 81.1

The following statement is a full description of this invention, including the best method of performing it known to us :

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X874-73-1D-13 P.C.

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This invention relates to the installation of lining material in furnaces and kilns, particularly ceramic fibre furnace linings where it is desirable to use a heat resistant (e.g. ceramic or refractory) anchoring system.

Use of multi-layer ceramic fibre material for lining furnaces or kilns is presently gaining ground because of decreased bulk as compared with brick linings and because of more efficient operating capabilities such as shorter heating and cooling cycles, decreased down time and longer life expectancy. Furthermore, weight of the fibrous material is only a small fraction of an equivalent brick lining and therefore the construction of the furnace shell using fibrous material may be of lighter strength than previously required with brick furnaces and kilns.

Several systems of anchoring the lining material to the furnace shell known to the applicant have been developed successfully, but all of these incorporate heat resisting metal anchors. These are positioned usually by welding, on the inside of the furnace shell and the several layers of ceramic fibre material are transfixed over these anchors. The top layer of fibre is ultimately held in place by some locking device (e.g. a washer and locknut). Heat resisting metal anchoring systems have temperature limitations to a maximum of about 1200°C and above these temperatures it is necessary to use ceramic anchoring systems if fibrous lining material is used and the furnace lining fixing is to have a reasonable life.

There are problems associated with the installation and fixing of fibre lining material using ceramic anchoring systems within a furnace shell both from the point of view

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of temporary fixing at the time of installation and permanent fixing of the lining suitable to ensure a lining life of several years with a minimum of maintenance.

It is a principal objective of the invention to provide an improved system for installing fibrous ceramic lining material in a furnace or kiln and an article therefor.

There is provided according to the present invention a method of installing fibrous heat insulating lining material in a furnace or kiln, said furnace or kiln having an outer shell comprised at least of walls and a ceiling having spaced apertures therein distributed over the surface area of said shell, the steps comprising applying and temporarily fixing a layer or layers of heat insulating material to at least a portion of the interior walls of the shell by securement to <sup>pin</sup>~~temporary fixing~~ means inserted through said apertures into the material and adapted to project into the interior of the shell through the insulating material, forming apertures in the material at points located by said <sup>pin</sup>~~temporary fixing~~ means suitable to accommodate a retainer of heat resistant material, fixing said retainer to the shell in the aperture formed in the insulating material to secure said insulating material to the shell.

In a preferred embodiment of the invention the insulating material may be installed in the shell by fitting a series of spikes ~~(or pins)~~ through the shell apertures. The temporary locking of these spikes is carried out quickly and conveniently preferably by means of a wing nut on the outside of the shell.

To convert to the permanent anchor, a hole preferably of the same diameter as the O.D. of the retainer is cut with

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a hollow cutting tool, through the multi layer fibrous lining, right through to the shell. This hole is centred over the temporary spike which is conveniently fixed in an aperture of the shell by a simple nut fixture, preferably a wing nut. The wing nut lock is now released and the impaled fibre and spike are easily withdrawn together when the drilling tool is withdrawn from the hole.

Conveniently the retainer of heat resistant material includes a captive nut for easy fixing onto a threaded bolt shank projecting through the shell aperture. The bolt shank may be varied in length to suit various lining widths selected for desired furnace performance. Consequently only one length of heat resistant retainer is required for any variation in lining thickness.

In a further preferred embodiment of the present invention the retainer of heat insulating material used in the fixing of lining material to a furnace or kiln shell comprises a hollow body member having a narrow aperture at one end and a flange at the other end, said body being adapted to extend at least part way for the lining width towards said shell and be removably fixed to said shell preferably by bolt and nut securing into the apertured end of the retainer.

Conveniently the respective apertures in the shell are located by an operator working inside the furnace shell by temporary fixing pins inserted into the lining from outside the shell.

A practical arrangement of the invention will

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now be described having reference to the accompanying drawings in which:-

Figure 1 is a partial view showing part of a furnace shell partially lined;

Figure 2 is a part sectional view of a lined shell;

Figure 3 shows a temporary fixing spike with lining fixed thereto;

Figure 4 shows a drilling tool prior to formation of aperture around a temporary fixing spike;

Figure 5 shows the removal of a temporary fixing spike;

Figure 6 shows a ceramic retainer in position fixed to the furnace shell.

The method of the present invention preferably incorporates a ceramic retainer as best shown in Figure 6 including a hollow flanged body 10 of heat resistant ceramic material having at one end an aperture 11 for locating a bolt shank therein. The internal end surface of the retainer is recessed at 12 to capture a nut 13 or bolt head therein. It is preferred that a nut is held captive therein. The outside end surface is formed conically at 14 to assist guiding of a bolt shank into the aperture 11 during installation of the retainer into a furnace.

The flanged portion 15 of the retainer is of suitable dimension to engage and retain the insulating lining 16 against the furnace or kiln shell as shown. In applying fibrous ceramic lining to a furnace or kiln shell it is necessary to fix the lining to the shell at frequent

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intervals' as best shown in Figure 1. In the confined spaces of a kiln or furnace it is difficult for a workman to operate on a complex fixing operation for the fibrous lining and therefore it is the prime objective of the present invention to simplify the installation procedure by the use of the abovementioned retainer.

The method of the present invention preferably requires the formation of a series of apertures 20 throughout the surface area of the outer supporting shell 21 of the furnace or kiln. Spikes 22 are inserted through these apertures and fixed to the furnace shell such as by a wing nut 23 or the like, and the fibrous lining 16 is forced over these spikes on the inside so that the spikes 22 project into the interior of the furnace through the thickness of the lining. The spikes then perform a double function of temporarily fixing the lining and locating the position of the shell apertures for the workman inside the furnace.

A hole is then bored using a drilling tool 24 shown in Figure 4. The hole is centred on each said spike having a diameter similar to the outer diameter of the hollow body of said retainer 10. Each spike 22 can be removed as the hole is drilled and after loose insertion of a retainer into the hole a bolt is inserted into the retainer aperture 11 and threaded onto the captive nut 13 therein. It will be obvious that a bolt may be held captive in the retainer and threaded through the shell aperture by the workman inside the furnace, however, it has been found more convenient to thread the bolt from outside the shell. It will be appreciated that the retainer may be fixed to the



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furnace shell by welding and this specification may be construed to include such obvious alternatives.

After fixing of the retainer the hollow body can simply be filled with heat resistant filling 25 thus protecting the metallic fixing portions at the bottom of the retainer.

It will be understood that no metal parts are directly exposed to the furnace atmosphere with the present invention and the preferred method of fixing is quite simply carried out and requires no special skills. Furthermore, the manufacture of retainer components is relatively inexpensive because of the use of simple standard components.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A method of installing fibrous heat insulating lining material in a furnace or kiln, said furnace or kiln having an outer shell comprised at least of walls and a ceiling having spaced apertures therein distributed over the surface area of said shell, the steps ~~of~~ comprising applying and temporarily fixing a layer or layers of heat insulating material to at least a portion of the interior walls of the shell by securement to <sup>pin</sup>~~temporary fixing~~ means inserted through said apertures into the lining and adapted to project into the interior of the shell through the insulating material, forming apertures in the material at points located by said <sup>pin</sup>~~temporary fixing~~ means suitable to accommodate a retainer of heat resistant material, fixing said retainer to the shell in the aperture formed in the insulating material to secure said insulating material to the shell.
2. A method as claimed in claim 1 in which the <sup>pin</sup>~~temporary fixing~~ means includes a series of spikes or pins fixed by a nut in said spaced apertures.
3. A method as claimed in claim 1 or 2 in which a hole of similar size to that of said retainer is formed concentrically on each <sup>pin</sup>~~temporary fixing~~ means, the temporary fixing means loosened and impaled fibre and temporary fixing means removed to provide accommodation for a retainer to be secured to the furnace shell at each aperture.
4. A method as claimed in claim 1 wherein said retainer of heat insulating material comprises a hollow body member having a narrow aperture at one end and a flange at the other.

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end, said body being adapted to extend at least part way for the lining width towards said shell and be removably fixed to said shell preferably by bolt and a captive nut within the hollow body securing into the apertured end of the retainer, said hollow tubular body being adapted to be filled with heat resistant filling.

5. A method of fixing a furnace lining in an apertured furnace shell substantially as hereinbefore described having reference to the accompanying drawings.

DATED this 17th day of November, 1976.

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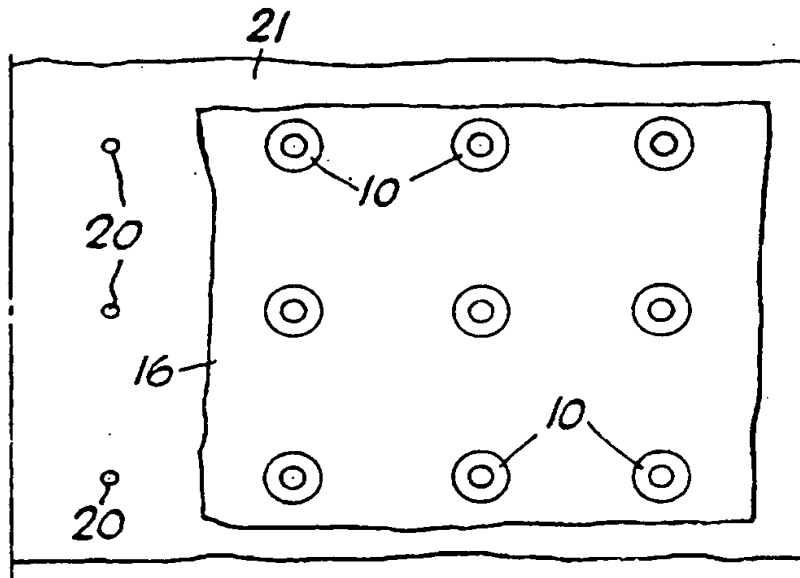


FIG. 1.

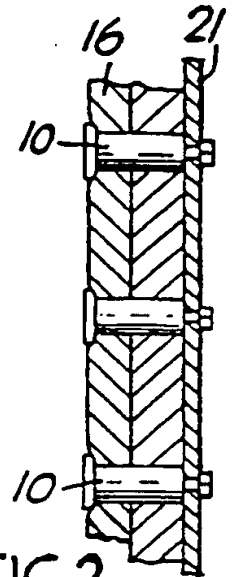


FIG. 2.

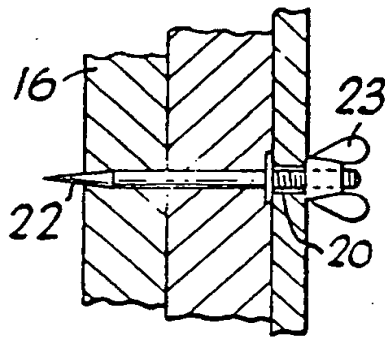


FIG. 3.

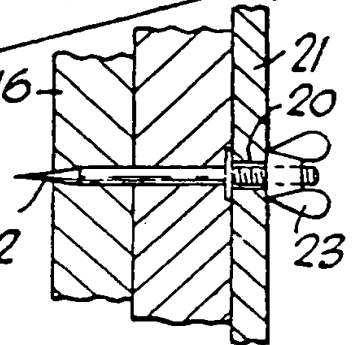
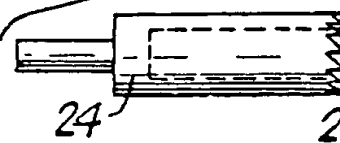


FIG. 4.

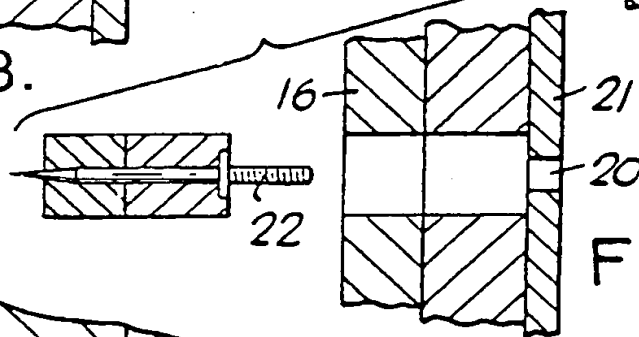


FIG. 5.

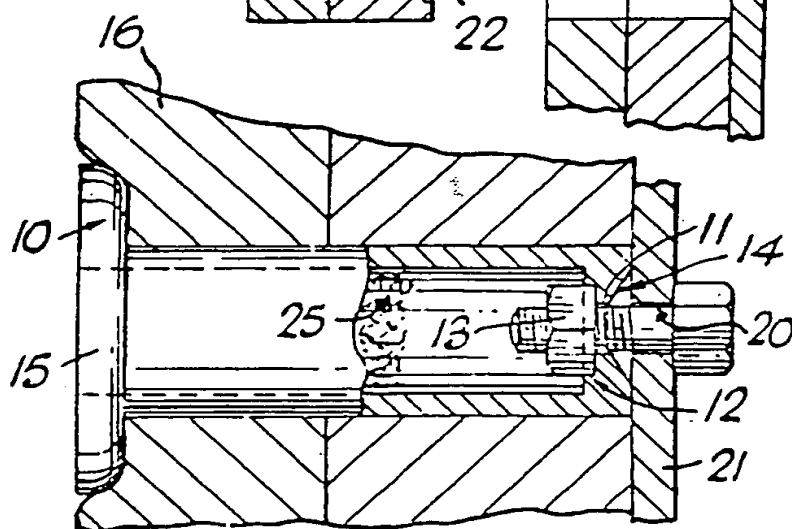


FIG. 6.

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